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On the HOME PRODUCE, IMPORTS, CONSUMPTION, *and* PRICE *of* WHEAT, *over* TWENTY-EIGHT (*or* TWENTY-SEVEN) HARVEST-YEARS, 1852-53 *to* 1879-80 *inclusive.*

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IN a paper "On the Home Produce, Imports, and Consumption of "Wheat," published in the "Journal of the Royal Agricultural "Society of England," in 1868, we gave records and estimates on the subject for sixteen harvest-years 1852-3 to 1867-8 inclusive; and in 1863, and each year since, an estimate for the then current year has been published in the "Times" and elsewhere, soon after harvest. We propose, on the present occasion, to pass in review the estimates formerly given, and to complete the record from the commencement up to the present time; namely, for twenty-eight (or twenty-seven) years, 1852-3 to 1879-80 inclusive. In our former paper we gave the records and estimates for each division of the United Kingdom separately, and for the whole collectively; but it is proposed now to confine the illustrations to the United Kingdom as a whole.

The main elements of the question are the following:—

1. The area under wheat.
2. The average yield of wheat per acre.
3. The aggregate home produce, and the amount of it available for consumption.
4. The imports.
5. The population.
6. The average consumption of wheat per head of the population, per annum.

The data then at command, and the results arrived at, are fully considered in the paper above mentioned, and we must refer to it for detailed information on most of the points in question, but the main facts may be briefly summarised here.

The Area under Wheat.—For the period from 1852 to 1865 inclusive, we had to rely on estimates alone in fixing the area under the crop in England and Wales. For Scotland, we had returns collected by the Highland Society for the years 1854-57; but for the two years prior to 1854, and for the years subsequent to 1857, down to 1865 inclusive, we had to rely on estimates merely. For Ireland, returns were available for each of the sixteen years included in the inquiry. Thanks to the exertions of Mr. Caird, we have for 1866, and for each year since, an official record of the area under the crop, in each division of the United Kingdom, and in the whole collectively, in the "Agricultural Returns" now annually published about the time of harvest. One element of uncertainty in any estimates of the home produce of wheat is, therefore, fortunately removed.

The Average Yield of Wheat per Acre.—The only returns or official estimates at command relating to this subject, were for Scotland for four years, and for Ireland for each year within the period of our inquiry; whilst, for England and Wales, comprising from 85 to 90 per cent. of the total area under the crop, there was, and there is, no official information whatever. For this large proportion of the United Kingdom it was, therefore, after very full consideration of the data, and of the results to which they led, decided to adopt the average produce per acre each year, on certain selected, and very differently manured plots, in the permanent experimental wheat field at Rothamsted, as the basis of estimates of the average produce per acre from year to year; and, each year since, the same data have been relied upon in forming an estimate of the average produce over the United Kingdom as a whole. But, having regard to the character of the soil at Rothamsted, to the characters of the individual seasons, and to the consideration whether the season was more favourable for heavy or for light land, and so on, the estimate actually adopted for the country at large has, in some seasons, and more especially in bad seasons, differed somewhat from the actual average indicated on the selected plots in the experimental field. Lastly, in all cases, the actual number of bushels is reduced by calculation so as to represent bushels of the standard weight of 61 lbs. per bushel.

It is proposed, on the present occasion, briefly to examine into the validity of the data thus taken as a basis for estimating the average yield per acre of the country each year, and also into the trustworthiness of the results arrived at, as tested by subsequent knowledge, and by their accordance, or otherwise, with the conclusions arrived at in regard to other elements of the question.

The Aggregate Home Produce, and the Amount of it Available for Consumption.—It will be obvious that, if we know the area under the crop, and have a trustworthy estimate of the average yield per acre, the aggregate home produce is ascertained by a very simple calculation. In determining the amount of the total produce available for consumption, allowance has to be made for the amount annually returned to the land as seed. For reasons formerly given, we have assumed 2¼ bushels per acre to be so returned to the land; and we do not propose to make any alteration in that estimate.

The Imports.—From the commencement of the period to which our inquiry relates, we have, for the United Kingdom collectively, returns, either of the net imports of wheat and wheat flour, or of the imports and exports from which the net imports can be calculated. For the separate divisions of the country the returns have not been so complete. But, as we are confining attention to the United Kingdom as a whole, this is immaterial for our present purpose. In the case of the United Kingdom, the records for the individual weeks or months are available; and from these the net imports have been calculated, not for the calendar years, but for the *harvest-years*, that is, from 1st September of one year, to 31st August of the next.

The Population.—As the Registrar-General publishes an estimate of the population at the middle of the calendar year, for every year between one census and another, it is easy to calculate, with sufficient accuracy for our purpose, the average number of consumers over each harvest-year. The middle of the calendar year being the end of June, and the middle of the harvest-year the end of February, the plan adopted has been to add to the number recorded for the preceding mid-summer, two-thirds of the difference between that figure and the number given for the next midsummer, thus bringing the estimate up to the end of February. Of course, this can only be done after the second record is published, and the plan was not available in estimating the population of the current harvest-year soon after harvest each year; but the necessary corrections have now been made. The figures show some irregularity of increase immediately after the census years, and at some other periods, presumably from a new factor being then adopted for the calculation of the annual increase of the population.

The Average Consumption of Wheat per Head of the Population per Annum.—Previously to the publication of our former paper on this subject, a higher figure had been generally assumed than we were then led to adopt. For England and Wales, we founded an estimate of the average consumption per head of the population, on the calculation of eighty-six different dietaries, arranged in fifteen divisions, according to sex, age, activity of mode of life, and other circumstances; and the result so obtained was compared with that arrived at on the basis of the population, and of the amounts of the available home produce, and of the net imports of wheat, each year. For Scotland, and for Ireland, it was only possible to found an estimate on the basis of population, and of the amounts of the home and foreign supplies. On these bases we estimated the average consumption of wheat, in the United Kingdom collectively, to be 5½ bushels per head of the population per annum, during the later years to which our inquiry related; and we have adopted that figure from that date up to the present time. This estimate, whether correct or not, has, from that time, been very generally adopted by other writers on the subject also. Its correctness, and its continued applicability, we propose to consider on the present occasion.

Thus, with regard to the area under the crop, the imports, and the population, we adopt, without modification, the same data or estimates as previously; but the basis of the estimates, and the results arrived at, in regard to the average produce of wheat per acre over the United Kingdom each year, and the estimates of the consumption per head of the population, we propose to submit to examination, and to correction or otherwise, as the case may be.

As already said, the estimate of the average yield of wheat per acre over the United Kingdom is, each year, founded on the average produce obtained on certain selected plots in the field at Rothamsted which has now grown the crop for thirty-six years in succession—without manure, with farmyard manure, and with various artificial manures. There has been no change in the treatment of the unmanured plot, or of the dunged plot, since the commencement of the experiments in 1843-4. There were, however, some changes in the manures applied to the various artificially manured plots during the first eight years from 1844 to 1851 inclusive. But for the period of twenty-eight years, from 1852 up to the present time, two of the selected artificially manured plots have respectively received exactly the same manure each year, and the third has done so for twenty-five years, as described below. The selected plots were:—

Plot 3. Unmanured every year, experiment commencing 1843-4.

Plot 2. Fourteen tons farmyard manure every year, commencing 1843-4.

Plot 7. Mixed mineral manure, and 400 lbs. ammonia-salts, each year, twenty-eight years, 1851-2, and since.

Plot 8. Mixed mineral manure, and 600 lbs. ammonia-salts, each year, twenty-eight years, 1851-2, and since.

Plot 9. Mixed mineral manure, and 550 lbs. nitrate of soda, each year, twenty-five years, 1854-5, and since.

In forming the estimate of the average produce per acre of the country at large, the plan adopted has been to take the mean produce of the unmanured plot, of the farmyard manure plot, and of the three artificially manured plots reckoned as one, and to reduce the result so obtained to bushels of the standard weight of 61 lbs. per bushel. As will be shown further on, experience has proved that this mode of estimate leaves but little to be desired as a means of computation of the average yield of the country over a number of years; but it has not been found to be equally applicable for each individual year. Careful comparison leads to the conclusion that the so-calculated average produce per acre on the selected plots gives somewhat too high a result for the country at large in seasons of great abundance, and too low a result in unfavourable seasons. Accordingly, as above referred to, in some seasons, instead of the actual average indicated by the experimental plots, a higher or a lower figure has been adopted; and, especially in the case of some of the recent bad seasons, a higher one has been taken.

Independently of any such admitted differences between the so directly calculated, and the actually adopted, estimate for individual years, the question arises—whether the average result indicated by the several selected plots remains as applicable as heretofore? or whether the produce of some is annually declining, or that of others annually increasing, irrespectively of the influence of season, so as to vitiate the continued applicability of such results for the purposes of such an estimate?

The Unmanured Plot.—There can be no doubt that the produce on this plot is gradually declining from exhaustion; and, independently of the evidence of diminishing produce, analyses of the soil at different periods show that there is a gradual diminution in the amount of nitrogen in it. Owing, however, to the great fluctuations in the amount of produce from year to year, dependent on season, it is by no means easy to estimate the rate of decline due to exhaustion of the soil, as distinguished from that due to the seasons. In the first place, it is difficult to say what figure should be adopted as the standard produce of the plot, by which to compare the yield from year to year. The whole field was manured with farmyard dung in 1839, and then grew turnips, barley, peas, wheat, and oats, before the commencement of the experiments in 1843-4. The plot then grew eight crops of wheat, to 1850-1, without manure, before the commencement of the period to which our present estimates refer. No doubt the land would suffer more or less exhaustion during those first eight years; but, as serving to counteract the tendency to decline in yield from that cause, it happened that, taken together, those eight seasons were of considerably more than average productiveness; so that perhaps we may assume the average produce of those eight years fairly to represent the standard produce of the unmanured land independently of material exhaustion. That produce was equal to 17 bushels at the standard weight at 61 lbs. per bushel. If now we calculate what should be the produce in each of the subsequent twenty-eight years, on the assumption that it fluctuated from the standard exactly in the proportion of the fluctuation from year to year of the adopted average yield of the country at large, and compare the result so obtained with the actual yield of the plot each year, we find that the latter shows an average annual deficiency over the twenty-eight years of 4⅜ bushels. According to this mode of calculation, therefore, this represents the decline of produce on the unmanured plot, irrespectively of season; and it may be observed that, supposing it to be uniform over the whole period, it would correspond to a rate of diminution, due to exhaustion, of between one-quarter and one-third of a bushel from year to year. It remains to be seen whether, with a return of good seasons, the decline will be as marked; and also whether, in time, a point will be reached at which the produce will remain constant, excepting so far as it is influenced by the fluctuations of the seasons.

The Farmyard Manure Plot.—If the unmanured plot is declining in yield and fertility, there can be no doubt that the farmyard manure plot is increasing in fertility. Analysis at different periods shows that the surface soil has become more than twice as rich in nitrogen as the unmanured land. In fact, as we have shown on several occasions, a large amount of the constituents of farmyard manure accumulates within the soil, and they are taken up very slowly by crops. It is indeed remarkable that, notwithstanding this great accumulation within the soil, the crops on the dunged plot never show over-luxuriance. During the last few years, there has even been a considerable decline in produce, due to unfavourable seasons, which have greatly encouraged the growth of weeds, and especially of grass; whilst, owing to the wetness of the seasons, it has been quite impossible effectually to clean the land, and what has been done to that end has not been accomplished without injury to the crop.

If, as in the case of the unmanured plot, we were to adopt the average of the first eight years, from 1844 to 1851, to represent the standard yield of the farmyard manure plot, irrespectively of material accumulation, the figure arrived at would be 28⅛ bushels. This is certainly a surprisingly low produce to be obtained by the annual application of 14 tons of farmyard manure per acre, for eight years in succession, and in seasons which, taken together, were of more than average productiveness. But if we adopt this as the standard produce of the plot, then calculate what should be the produce in each of the subsequent twenty-eight years, provided it fluctuated from year to year exactly in the same degree as the average produce of the country at large, and then take the difference between this calculated produce fluctuating by season alone, and that actually obtained each year, we ascertain the increase or decrease due to accumulation by manure. On this mode of calculation we get an average annual increase, due to accumulation, of 5¼ bushels. If, on the other hand, instead of the average produce of the first eight years, we take the average of the whole thirty-six years of the application of the dung, we get, instead of 28⅛ bushels, 32⅛ bushels, as the standard with which to compare the annual produce. Adopting this figure, and following the same line of calculation as before to exclude the influence of season, we have an average annual excess, due to accumulation, of only 1¼ bushel. There can be no doubt that were it not for the adverse influence of the recent wet seasons, the estimated excess would be more than 5¼ bushels adopting the first standard, and more than 1¼ bushel adopting the second. Probably the truth lies between these two figures; and, if so, it would appear that, up to the present time at any rate, the gradually diminishing produce on the unmanured plot, due to exhaustion, and the gradually increasing produce on the dunged plot, due to accumulation, approximately balance one another.

The Artificially Manured Plots.—Though obviously open to objection, in default of any better alternative, we adopt for these plots the average produce of the twenty-eight (or twenty-five) years, to represent the standard yield irrespectively of exhaustion or accumulation. Doing this, and excluding the influence of season by the same line of calculation as before, there is no evidence of material increase, or of material decrease, on either of the plots receiving ammonia-salts, other than that due to season. The first fourteen of the twenty-eight years included a number of seasons of unusually high productiveness, and the last fourteen a number of unusual deficiency. The calculations show, accordingly, an excess over the assumed standard produce during the first half of the period, and a closely corresponding deficiency over the second half, in both the cases where ammonia-salts were used. Where the nitrate of soda was employed, there was, on the other hand, a somewhat greater deficiency over the first period than there was an excess over the second, indicating for the total period a slight deficiency.

Finally, taking the average of the unmanured plot, of the farm-yard manure plot, and of the three artificially manured plots reckoned as one, as is annually done for the purpose of our estimate; then correcting the result for each year as before for the fluctuations of season; and comparing the results so obtained with the actual averages, the actual results show a very slight excess over the first half of the period, including more than an average of good seasons, and a somewhat greater, but still small, deficiency over the second period, including more than the average of bad seasons. The average of the whole indicates, therefore, no gain by accumulation, but if anything a slight loss.

Comparing the direct average of the experimental plots with that actually adopted as the average for the United Kingdom each year, the experimental plots indicate for the whole twenty-eight years about three-quarters of a bushel less per acre per annum than the actually adopted estimates founded upon them.

Taking the average of the twenty-eight years' adopted estimate of produce per acre as 100, the first column of the following table shows the deviation from this general average for the whole period, over the first eight, the second eight, the third eight, and the last four, years of the twenty-eight; and the second column shows the deviation, from the same standard, of the average produce per acre on the selected plots.

TABLE I.—*Showing the Deviation over each separate Period from the adopted Average of the whole Period taken as* 100.

	Actually Adopted Averages.	Averages of Plots 3, 2, and 7, 8, and 9.
First eight years, 1852-59	103	101
Second ,, '60-67	104	106
Third ,, '68-75	98	99
Last four years, '76-79	89	71
Total period, twenty-eight years....	100	98

So far as the annually adopted estimates are correct, the figures in the first column indicate the actual fluctuations in the average produce per acre of the country at large, due to the characters of the seasons, over each period compared with the others, and with the total period.

The first period of eight years included two of considerably over average, another over average, three rather under, and two very much under average. The result was, however, upon the whole slightly over the average of the twenty-eight years. The adopted average produce showed 3 per cent. over the average of the twenty-eight years, and 2 per cent. over the actual average on the selected plots, a higher figure than the actual average having been adopted in the case of the two years of very low produce.

Within the second period of eight years, there were two of the highest yield over the twenty-eight years, two more somewhat over average, two under, and two much under average. In this period highly productive seasons prevailed; the adopted average is 4 per cent. over the average of the twenty-eight years, and the actual average on the selected plots is 6 per cent. over, or 2 per cent. higher than the adopted average.

In the third period of eight years there was only one of really high produce, two more were over average, one was under, and four were considerably under average, the mean of the whole being under average. The adopted average for the period shows 2 per cent. under the average of the twenty-eight years, whilst the average of the experimental plots shows 1 per cent. under the average.

The last four years include only one over average, two under, and one (1879) very abnormally under average. Over this period, the adopted average amounted to only 89 per cent. of that for the twenty-eight years; and, with the unusual prevalence of bad seasons, the experimental plots showed only 71 per cent., or much lower than the adopted average.

Thus, it appears that, in fairly average seasons, the mean produce of the experimental plots fairly represents the average produce; that in seasons of unusual abundance the experimental plots indicate too high a figure; and that in seasons of great deficiency they give too low a figure. Upon the whole, it is concluded that we have no better basis for estimating the average yield of the country each year, than that of the average produce of the same selected plots as heretofore relied upon; but that, as heretofore, some judgment must be exercised each year, according to the characters of the season, in deciding whether to adopt the actual figure indicated by the experimental plots, or in which direction, and in what degree, it should be modified. It will, moreover, have to be considered from time to time, whether any reduction of area that may take place is in greater degree due to the elimination of districts where the soil, or the climate, or the combination of the two, is the less, or the more, favourable for the crop; for it is obvious that, other things being equal, the average produce per acre of the remaining area will increase or diminish accordingly.

The next point is to test, as far as the means exist to that end, the correctness of the estimates of the aggregate home produce, and of the consumption per head per annum, as given in our former paper for the first sixteen years, and as annually published as forecast since that period.

In our annual estimates we have adopted a figure for the average produce per acre over the United Kingdom, calculated the aggregate produce, deducted from this the amount required for seed, and then estimated how much would be required, from stocks and imports, to make up the total requirement for consumption, this being reckoned at a fixed rate per head of the population. Now, however, we have the actual record of the imports each year as a fixed element of the inquiry; and, adopting the same returns or estimates as to area and population as heretofore, the question now is—not what will be the imports, but how far the estimates of home produce have been correct? and how far these estimated amounts, minus the quantities required for seed, and plus the actual imports, give a total corresponding with the estimated requirement for consumption?

The following table shows the averages, for the first eight, for the second eight, for the third eight, for the succeeding three, and for the total period of twenty-seven years, of—

1. The aggregate home produce of wheat, deduced by calculating the amount required for consumption (at the rate of 5·1 bushels per head per annum during the first eight years, and of 5·5 bushels in each subsequent year, as up to this time assumed), deducting from this the imports, and adding $2\frac{1}{4}$ bushels per acre for seed.
2. The aggregate home produce calculated according to the annual estimates of the average produce per acre, as previously published.
3. The difference between the estimate of total home produce founded on consumption and imports, and that founded on the annually adopted estimates of average produce per acre.
4. The average produce per acre, calculated from the aggregate home produce founded on the estimated requirements for consumption and the imports.
5. The average produce per acre, according to the annually adopted estimates.
6. The difference between the average produce per acre calculated from the aggregate home produce deduced from consumption and imports, and the annually adopted estimates of average produce per acre.

TABLE II. — *Comparing the Estimates of Home Produce founded on Requirement for Consumption and Imports, with those founded on the Annually Adopted Estimates of Average Produce per Acre, over the United Kingdom.*

	Aggregate Home Produce.			Average Produce per Acre.		
	Deduced from Calculated Requirements for Consumption and Imports.	According to Annually Adopted Estimates of Average Produce per Acre.	Annually Estimated + or − Calculated according to Requirements, &c.	According to Consumption and Imports.	According to Annually Adopted Estimates.	Annual Estimate + or − Calculated.
Averages for—	Qrs.	Qrs.	Qrs.	Bshls.	Bshls.	Bshls.
8 yrs., 1852-59	14,390,956	14,310,779	− 80,177	$28\frac{1}{8}$	28	$-0\frac{1}{8}$
8 ,, '60-67	13,312,217	13,309,247	− 2,970	$28\frac{3}{8}$	$28\frac{3}{8}$	0
8 ,, '68-75	12,174,772	12,699,155	+ 524,383	$25\frac{5}{8}$	$26\frac{3}{4}$	$+1\frac{1}{8}$
3 ,, '76-78	10,393,500	11,166,910	+ 773,410	$25\frac{1}{2}$	$27\frac{1}{4}$	$+1\frac{3}{4}$
27 yrs., 1852-78	12,970,521	13,181,636	+ 211,115	$27\frac{1}{4}$	$27\frac{5}{8}$	$+0\frac{3}{8}$

Leaving out of view for the present, any consideration of the inevitable discrepancies which must appear between the results of these two modes of estimate for individual years, it is obvious that, whether we compare the aggregate home produce founded on the requirements for consumption and on imports, with that founded on the annually adopted estimates of produce per acre, or compare the estimated average produce per acre itself arrived at in the two different ways, there is, taking the average of the twenty-seven years, comparatively little difference between the results thus variously arrived at. The annually adopted estimates of produce per acre over the United Kingdom give, however, the higher result.

It is obvious that, to bring out still more close conformity of result from the two modes of estimate, we must either raise the estimate of requirement for consumption per head, or lower that of the average produce per acre over the United Kingdom, for some of the years. Unfortunately, we have little else than judgment to aid us in deciding between these two alternatives. If, however, we compare the average result by the two methods for shorter periods —for the first, for the second, for the third eight years, and for the last three years, of the twenty-seven, for example—it is seen that the results of the two estimates agree very closely indeed for the first two periods of eight years each; but that, for the third and fourth periods, those founded on the requirements for consumption and the imports, are considerably lower than the average of the annually adopted estimates for those periods. The fact is that, for each of the first two periods, the estimated consumption was itself finally founded on the estimated home produce and the imports of the period; so that, although there will be discrepancy in the results arrived at in the two ways for individual years, there could not be material disagreement over the whole of either of those periods. For each of the last two periods, however, the estimate of consumption per head has been annually adopted independently, as forecast, and the discrepancy between the results of the two modes of estimate for those periods has, therefore, a real significance.

Independently of the question of whether or not any correction in the estimates for individual years should be made, the foregoing results would lead to the conclusion that the actual consumption per head, taken together with the amount consumed by stock, has been greater over the last two periods than has been annually assumed. If now we assume the requirement per head to have been 5·6 bushels over the third eight years, and 5·65 bushels over the last three years, instead of, as previously, 5·5 bushels over those eleven years, this would bring the two estimates into very much closer agreement. We should then have the average produce per acre per annum over the United Kingdom, for the respective periods, as follows:—

TABLE III.

	Average Produce per Acre.	
	According to Increased Consumption, and Imports.	According to Annually Adopted Estimates.
	Bshls.	Bshls.
Average 8 years, 1852-53—1859-60........	$28\frac{1}{8}$	28
,, 8 ,, '60-61— '67-68........	$28\frac{3}{8}$	$28\frac{3}{8}$
,, 8 ,, '68-69— '75-76........	$26\frac{1}{2}$	$26\frac{3}{4}$
,, 3 ,, '76-77— '78-79........	27	$27\frac{1}{4}$
Average 27 years, 1852-3—1878-9	$27\frac{5}{8}$	$27\frac{5}{8}$

It will be observed that, even with the estimates of the average consumption per head raised as above supposed, the average produce per acre founded on the annual estimates is slightly higher over the last two periods than that founded on consumption and imports. It must be borne in mind that the quantity of wheat consumed by farm stock is an unknown and varying element; and, either the estimate of the consumption per head of the population must be fixed to include the average consumption in other ways, or the annual estimates of produce per acre, and of the aggregate home produce founded upon them, should exceed those founded on consumption and imports. It may be remarked that an increase of one-tenth of a bushel in the consumption per head per annum would, if derived from home produce, represent an increase of 1 bushel per acre per annum over the United Kingdom, assuming a population of 33 millions, and an area under the crop of 3,300,000 acres; figures which closely represent the actual facts a very few years ago. It is obvious that, with an increasing population, and a diminishing area under wheat, such an assumed increase in consumption per head would correspond to more than a bushel per acre.

The following Table (IV) shows the amount of home produce required for consumption within each harvest-year, as calculated by deducting the imports from the estimated total requirement for consumption, adopting the increased estimates of consumption per head, as above assumed, for the last eleven years; and, for comparison with the result so obtained, there is given the amount of home produce available for consumption each year, according to the annual estimates of the average produce per acre, with $2\frac{1}{4}$ bushels per acre deducted for seed. The difference between the two is shown in the last column.

TABLE IV.

Harvest Years; 1st Sept. to 31st Aug.	Total Required for Consumption: At 5·1 Bushels 1st 8 Years; at 5·5 Bushels 2nd 8 Years; at 5·6 Bushels 3rd 8 Years; at 5·65 Bushels last 4 Years, per Head per Annum.	Imports.	Difference: Required from Home Produce within each Harvest Year.	Home Produce Available for Consumption according to Annual Estimates of Average Produce per Acre ($2\frac{1}{4}$ Bushels per Acre Deducted for Seed).	Available Home Produce according to Annual Estimates + or − Calculated Requirement within each Harvest Year.
	Qrs.	Qrs.	Qrs.	Qrs.	Qrs.
1852–53	17,538,354	5,902,000	11,636,354	10,433,464	− 1,202,890
'53–54	17,607,749	6,092,000	11,515,749	9,337,546	− 2,178,203
'54–55	17,701,710	2,983,000	14,718,710	16,427,742	+ 1,709,032
'55–56	17,816,807	3,265,000	14,551,807	12,776,300	− 1,775,507
'56–57	17,932,364	4,112,584	13,819,780	13,007,453	− 812,327
'57–58	18,055,662	5,795,687	12,259,975	16,143,915	+ 3,883,940
'58–59	18,183,671	4,555,670	13,628,001	15,147,874	+ 1,519,873
'59–60	18,306,247	4,516,332	13,789,915	12,004,575	− 1,785,340
1860–61	19,874,968	10,023,968	9,851,000	9,956,012	+ 105,012
'61–62	20,025,576	9,099,455	10,926,121	11,175,183	+ 249,062
'62–63	20,165,540	9,205,086	10,960,454	12,882,069	+ 1,921,615
'63–64	20,287,594	6,991,270	13,296,324	16,881,807	+ 3,585,483
'64–65	20,419,321	5,500,705	14,918,616	15,179,783	+ 261,167
'65–66	20,547,130	7,313,026	13,234,104	12,950,305	− 283,799
'66–67	20,684,813	7 633,033	13,051,780	10,458,645	− 2,593,135
'67–68	20,830,600	9,015,543	11,815,057	8,545,890	− 3,269,167
1868–69	21,368,178	8,243,389	13,124,789	15.626,060	+ 2,501,271
'69–70	21,532,105	10,000,004	11,532,101	12,301,205	+ 769,104
'70–71	21,909,347	8,841,090	13,068,257	13,089,893	+ 21,636
'71–72	22,224,385	9,316,600	12,907,785	10,382,493	− 2,525,292
'72–73	22,428,445	12,291,463	10,136,982	10,438,729	+ 301,747
'73–74	22,622,952	11,583,645	11,039,307	9,290,343	− 1,748,964
'74–75	22,840,258	11,739,710	11,100,548	12,898,085	+ 1,797,537
'75–76	23,082,333	13,948,644	9,133,689	9,033,000	− 100,689
1876–77	23,537,495	12,158,006	11,379,489	8,857,015	− 2,522,474
'77–78	23,826,133	14,511,181	9,314,952	10,039,073	+ 724,121
'78–79	24,058,216	14,431,971	9,626,245	11,698,672	+ 2,072,427
'79–80	(24,334,025)	—	—	(5,047,840)	—
Averages					
8 years 1852–59	17,892,820	4,652,784	13,240,036	13,159,859	− 80,177
8 years 1860–67	20,354,443	8,097,761	12,256,682	12,253,711	− 2,971
8 years 1868–75	22,251,000	10,745,568	11,505,432	11,632,476	+ 127,044
3 years 1876–78	23,807,281	13,700,386	10,106,895	10,198,253	+ 91,358
27 years 1852–78	20,570,665	8,484,076	12,086,589	12,109,746	+ 23,157

When it is borne in mind that the first estimate (Col. 4) represents the requirement alone each year, and the second (Col. 5) the amount available for consumption from the estimated actual crop each year, it will be obvious that agreement between the two estimates for individual years is not to be expected. The amounts carried over from one harvest-year to another will of course vary exceedingly according to circumstances, the influence of which cannot with any certainty be estimated. We have, for example, no reliable information as to the quantity of home produced wheat held in the farmers' hands, the quantity consumed by farm stock, or otherwise used, or the quantity of foreign wheat held over in the granaries. Then, again, the actual length of the period to be provided for, dependent on the earliness or the lateness of consecutive harvests, has to be taken into account.

Referring to the actual differences for individual years, as shown by the figures in the last column of the Table (IV), it is obvious that, whilst there may be, and frequently is, an excess of wheat available over that required for consumption within the harvest-year, there cannot be an actual deficiency. Without attempting to account for each individual difference, it may be observed that the deficiencies which the figures indicate in some of the earlier years would doubtless be compensated, at any rate in part, if the balance were brought forward from the immediately preceding years; the last three of which were seasons of more than average productiveness, and of lower than average price, conditions which imply abundance. Then as to some of the excesses. It may be mentioned in illustration that, in each of the four consecutive years, 1862-65, there was more, and in two of them very much more, than the average produce over the country at large; and it was estimated that, at the harvest of 1865, there still remained over from the extraordinary crop of 1863, and the abundant one of 1864, wheat equal to from one-third to one-half of an average crop; and that, even at the harvest of 1866, some of the crop of 1863 remained unthrashed. It may, indeed, be stated generally, that as a rule the excesses follow, as they should, seasons of high productiveness, and the deficiencies seasons of low productiveness.

Discrepancies between the two results for individual years are, in fact, inevitable; and the figures strikingly illustrate the difficulty of the subject so far as individual years are concerned. But if the bases of the estimates are correct, the results of the two methods should agree when averaged over a sufficient number of years. An examination of the averages for the different periods, given at the foot of the table, will show that, with the increased estimates of consumption per head for the last two periods, the agreement between the differently obtained results is really very close.

Finally, as to the questions—whether our previous estimates of the consumption of wheat per head of the population, over the first two periods of eight years each, are correct? and whether we are to conclude that there really has been an increased consumption per head in the subsequent years?

There can be no doubt that the average consumption per head has increased in the United Kingdom as a whole since the establishment of free trade in corn; and there can be but little doubt that it has done so less rapidly during the later, than during the earlier, years since that change. This will be the case, at any rate with the much larger proportion of the total population which is comprised within England and Wales; though the increased consumption has probably been developed later in Scotland, and perhaps in Ireland also. The amount consumed will obviously vary according to the prosperity or otherwise of the people, to the price of wheat itself, and to that of other articles of food also. With regard to the price of wheat, barring exceptional cases, there has been a general tendency to decline throughout the period to which our estimates refer. Independently of the influence of lower prices, and of the increased prosperity of the masses of the population, among the circumstances tending to increase the consumption of wheat in recent years may be mentioned the increased price of meat; whilst, among those tending to limit the rate of increase of consumption may be noted the fact that the proportion of the total wheat consumed which is derived from foreign sources is rapidly increasing, and the drier foreign wheats will undoubtedly yield a larger percentage of flour, and flour of better quality, than much of the home-grown grain.

As already explained, the estimates of consumption per head over the first sixteen years, although controlled by the calculation of numerous dietaries, were finally founded on the estimated amounts of home produce, and the ascertained amounts of the imports; and they were calculated for the first half, and the second half, of that period, separately, in order to ascertain whether or not an increased rate of consumption were indicated. The result was that the so-reckoned available supplies showed a consumption of about 5·1 bushels per head per annum over the first eight years, and of 5·5 bushels over the second eight years. Of course, even supposing that the estimates of the available supplies over the whole period were correct, and that there was a considerable increase in the rate of consumption during the period, it is not to be assumed that there was the sudden rise from the first to the second eight years, which, taking the averages over those separate periods shows. It is, indeed, doubtful whether the estimates of consumption per head over the earlier years, as deduced from the amounts estimated to be available from the home produce and the imports, may not be somewhat too low, due to an under estimate of the area under the crop in those years. But, as no data exist upon which to base a trustworthy correction, the safer alternative seems to be simply to call attention to this probability.

Then, again, a careful consideration of our annual estimates of produce per acre subsequent to the first sixteen years, leads to the conclusion that some are more probably too low than too high. For 1866 and 1867, for example, our own estimates are lower than those of some others; and that for 1867, at any rate, may we think probably be somewhat too low. But here, again, there is lack of sufficient evidence to justify an alteration.

Upon the whole, we are disposed to conclude that our estimates of consumption per head during the first period of eight years, may be somewhat too low. We also conclude that our previously published estimates of consumption for the years subsequent to the first sixteen, are more probably too low, than that our estimates of average produce per acre, and of aggregate produce founded upon them, are too high. For the reasons given, however, we adopt our previous estimates of average produce per acre each year without change. We also adopt our previous estimates of consumption per head for the first two periods of eight years each without change. But, for the third period of eight years we assume the consumption to have been at the rate of 5·6 bushels per head, and for the last three years at the rate of 5·65 bushels, instead of 5·5 bushels over those eleven years, as previously reckoned.

Accordingly, until further experience should indicate further change to be necessary, we propose to adopt $5\frac{2}{3}$ bushels as the average consumption per head of the population per annum, over the United Kingdom.

Table IV, p. 13, shows the estimated aggregate consumption of wheat in each year, and the amount of it derived from home and foreign sources respectively; and Table V, which follows, brings to one view the particulars of the estimated home produce, of the imports, of the consumption per head, of the average "Gazette" price per quarter, and of the cost of wheat (at the average "Gazette" price) in the United Kingdom, in each of the twenty-eight (or twenty-seven) harvest years, from 1852-3 up to the present time.

Referring to the upper portion of the table for all details, and to the text for further information respecting some of them, the general tendency of the changes which have taken place within the period of our review is clearly indicated in the average results over the periods of eight, eight, eight, three, and twenty-seven years, given at the foot of the table.

According to the figures, the area under wheat was about 20 per cent. less over the last three, than over the first eight years, of the twenty-seven.

The average produce per acre over the United Kingdom was considerably less over the last two, than over the first two periods. It amounted to only 27⅝ bushels over the whole twenty-seven years, as compared with 28¼ bushels which we had previously assumed to represent the average produce per acre of the country at large.

Owing to the reduced produce per acre in recent years, the aggregate home-produce has reduced in a somewhat greater degree than has the area under the crop.

The annual imports averaged about three times as much over the last three, as over the first eight, of the twenty-seven years.

The total consumption of wheat per annum has increased from an average of about 18 million quarters over the first eight years, to nearly 24 million quarters over the last three years.

According to the figures, the average consumption per head per annum was only about 5·1 bushels over the first eight years, but it amounted to 5·67 bushels over the last three years.

The price of wheat per quarter has declined from an average of 57*s.* 8*d.* over the first eight years (including the period of the Crimean War), to 49*s.* over the last three years.

The annual value of the home produce available for consumption has declined from an average of nearly 38,000,000*l.* over the first eight years, to less than 25,000,000*l.* over the last three years.

The annual value of the imported wheat has increased from an average of little more than 13,000,000*l.* over the first eight years, to more than 33,000,000*l.* over the last three years.

The annual value of the total wheat estimated to be consumed has ranged from under 40,000,000*l.* to more than 71,000,000*l.*; and it has increased from an average of about 51,500,000*l.* over the first eight years, to more than 58,000,000*l.* over the last three years.

The average annual cost of wheat per head has somewhat reduced in the later periods; and it has been 36*s.* 2*d.* over the twenty-seven years.

Over the whole period of twenty-seven years, 40·4 per cent. of the wheat consumed has been derived from imports; and the amount supplied from foreign sources has increased from an average of 26·5 per cent. of the total over the first eight years, to 57·4 per cent. of the total consumed over the last three years, of the twenty-seven.

Table V.—*Particulars of Home Produce, Imports, Consumption, and Price of Wheat, i*

Harvest Years, 1st Sept. to 31st Aug.	Estimated Home Produce.			Available for Consumption.			Population (middle of Harvest Years).	Available for Consumption per Head.		
	Area under Crop.	Average Yield per Acre.	Total Home Produce.	Home Produce, less 2¼ Bushels per Acre for Seed.	Imports, less Exports.	Total.		From Home Produce.	From Imports	Total
	Acres.	Bhls.	Qrs.	Qrs.	Qrs.	Qrs.		Bhls.	Bhls.	Bhls
1852–53	4,058,731	22⅞	11,574,982	10,433,464	5,902,000	16,335,464	27,511,144	3·03	1·71	4·74
'53–54	4,013,963	20⅞	10,466,473	9,337,546	6,092,000	15,429,546	27,619,999	2·70	1·76	4·46
'54–55	4,036,969	34¾	17,563,140	16,427,742	2,983,000	19,410,742	27,767,388	4·73	0·85	5·58
'55–56	4,076,447	27⅜	13,922,801	12,776,300	3,265,000	16,041,300	27,947,933	3·65	0·93	4·58
'56–57	4,213,651	27	14,192,543	13,007,453	4,112,584	17,120,037	28,129,198	3·70	1·16	4·86
'57–58	4,185,974	33⅛	17,321,221	16,143,915	5,795,687	21,939,602	28,322,607	4·56	1·63	6·19
'58–59	4,131,822	31½	16,309,949	15,147,874	4,555,670	19,703,544	28,523,406	4·24	1·28	5·52
'59–60	4,019,725	26⅛	13,135,124	12,004,575	4,516,332	16,520,907	28,715,682	3·34	1·25	4·59
1860-61	3,992,657	22⅛	11,078,948	9,956,012	10,023,968	19,979,980	28,909,045	2·75	2·77	5·52
'61–62	3,898,177	25¼	12,271,546	11,175,183	9,099,455	20,274,638	29,128,110	3·06	2·49	5·55
'62–63	3,823,947	29¼	13,957,554	12,882,069	9,205,086	22,087,155	29,331,695	3·51	2·51	6·02
'63–64	3,698,629	38¾	17,922,048	16,881,807	6,991,270	23,873,077	29,509,228	4·57	1·89	6·46
'64–65	3,685,493	35¼	16,216,328	15,179,783	5,500,705	20,680,488	29,700,831	4·08	1·48	5·56
'65–66	3,646,691	30⅝	13,975,936	12,950,305	7,313,026	20,263,331	29,886,735	3·47	1 95	5·42
'66–67	3,649,584	25⅛	11,485,091	10,458,645	7,633,033	18,091,678	30,087,001	2·78	2·02	4·80
'67–68	3,628,910	21	9,566,522	8,545,890	9,015,543	17,561,433	30,299,054	2·25	2·38	4·63
1868–69	3,937,275	34	16,733,419	15,626,060	8,243,389	23,869,449	30,525,967	4·09	2·16	6·25
'69–70	3,976,147	27	13,419,496	12,301,205	10,000,004	22,301,209	30,760,150	3·20	2·60	5·80
'70–71	3,773,663	30	14,151,236	13,089,893	8,841,090	21,930,983	31,299,067	3·35	2·26	5·61
'71–72	3,818,848	24	11,456,544	10,382,493	9,316,600	19,699,093	31,749,121	2·62	2·35	4·97
'72–73	3,839,532	24	11,518,596	10,438,729	12,291,463	22,730,192	32,040,636	2·61	3·07	5·68
'73–74	3,670,259	22½	10,322,603	9,290,343	11,583,645	20,873,988	32,318,503	2·30	2·87	5·17
'74–75	3,821,655	29¼	13,972,926	12,898,085	11,739,710	24,637,795	32,628,940	3·16	2·88	6·04
'75–76	3,503,709	22⅞	10,018,418	9,033,000	13,948,644	22,981,644	32,974,761	2·19	3·39	5·58
1876–77	3,114,555	25	9,732,984	8,857,015	12,158,006	21,015,021	33,327,426	2·13	2·92	5·05
'77–78	3,311,859	26½	10,970,533	10,039,073	14,511,181	24,550,254	33,736,117	2·38	3·44	5·82
'78–79	3,372,590	30	12,647,213	11,698,672	14,431,971	26,130,643	34,064,731	2·75	3·39	6·14
'79–80	(3,047,752)	(15½)	(5,905,020)	(5,047,840)	—	—	(34,455,257)	—	—	—
Avergs.‡										
8 years 1852–59	4,092,160	28	14,310,779	13,159,859	4,652,784	17,812,643	28,067,170	3·75	1·33	5·08
8 years 1860-67	3,753,011	28½	13,309,247	12,253,712	8,097,761	20,351,473	29,606,462	3·31	2·19	5·50
8 years 1868-75	3,792,636	26⅝	12,699,155	11,632,476	10,745,568	22,378,044	31,787,143	2·93	2·70	5·63
3 years 1876–78	3,266,335	27⅛	11,116,910	10,198,253	13,700,386	23,898,639	33,709,425	2·42	3·25	5·67
27 years 1852–78	3,811,165	27⅝	13,181,636	12,109,746	8,484,076	20,593,822	30,252,388	3·22	2·22	5·44

* Exclusive of the islands in the British seas.

† Consumption reckoned at 5·1 bushels per head per annum the first eigh

‡ The "averages" are, in each case, the mere means of the figures in th

e *United Kingdom,* Twenty-Eight* (*or Twenty-Seven*) *Years*, 1852-53 *to* 1879-80 *inclusive.*

Average Gazette Price per Quarter.	Value of Wheat available for Consumption (at Average Gazette Price).			Value of Wheat Estimated to be Consumed† (at Average Gazette Price).		Per Cent. of Total Available.		Harvest Years, 1st Sept. to 31st Aug.
	From Home Produce.	From Imports.	Total.	Total.	Per Head.	From Home Produce.	From Imports.	
s. *d.*	£	£	£	£	*s.* *d.*	Pr. cnt.	Pr. cnt.	
44 7	23,257,930	13,156,542	36,414,472	39,095,914	28 5	63·9	36·1	1852–53
72 11	34,043,136	22,210,417	56,253,553	64,194,918	46 6	60·5	39·5	'53–54
70 1	57,565,546	10,452,929	68,018,475	62,029,742	44 8	84·6	15·4	'54–55
73 11	47,219,075	12,066,896	59,285,971	65,847,949	47 2	79·6	20·4	'55–56
60 1	39,076,556	12,354,888	51,431,444	53,871,810	38 4	76·0	24·0	'56–57
47 8	38,476,331	13,813,054	52,289,385	43,032,661	30 5	73·6	26·4	'57–58
43 8	33,072,858	9,946,546	43,019,404	39,701,015	27 10	76·9	23·1	'58–59
48 3	28,961,037	10,895,651	39,856,688	44,163,821	30 9	72·7	27·3	'59–60
55 3	27,503,483	27,691,212	55,194,695	54,904,599	38 0	49·8	50·2	1860–61
58 2	32,501,157	26,464,248	58,965,405	58,241,050	40 0	55·1	44·9	'61–62
47 8	30,702,264	21,938,788	52,641,052	48,061,204	32 9	58·3	41·7	'62–63
41 0	34,607,704	14,332,104	48,939,808	41,589,568	28 2	70·7	29·3	'63–64
40 1	30,422,815	11,024,330	41,447,145	40,923,723	27 7	73·4	26·6	'64–65
46 6	30,109,459	17,002,785	47,112,244	47,772,077	32 0	63·9	36·1	'65–66
60 4	31,550,246	23,026,316	54,576,562	62,399,183	41 6	57·8	42·2	'66–67
68 4	29,198,458	30,803,105	60,001,563	71,171,217	47 0	48·7	51·3	'67–68
50 0	39,065,150	20,608,473	59,673,623	53,420,445	35 0	65·5	34·5	1868–69
46 2	28,395,282	23,083,343	51,478,625	49,703,276	32 4	55·2	44·8	'69–70
54 2	35,451,794	23,944,619	59,396,413	59,337,815	37 11	59·7	40·3	'70–71
56 7	29,373,803	26,358,214	55,732,017	62,876,489	39 7	52·7	47·3	'71–72
57 4	29,924,356	35,235,527	65,159,883	64,294,876	40 2	45·9	54·1	'72–73
61 3	28,451,675	35,474,913	63,926,588	69,282,791	42 10	44·5	55·5	'73–74
44 7	28,751,981	26,169,770	54,921,751	50,914,742	31 3	52·4	47·6	'74–75
45 11	20,738,263	32,023,761	52,762,024	52,993,190	32 2	39·3	60·7	'75–76
54 7	24.172,270	33,181,225	57,353,495	64,237,747	38 7	42·1	57·9	1876–77
50 10	25,515,977	36,882,585	62,398,562	60,558,088	35 11	40·9	59·1	'77–78
41 7	24,323,489	30,006,473	54,329,962	50,021,041	29 4	44·8	55·2	'78–79
—	—	—	—	—	—	—	—	'79–80
								Avergs.‡
57 8	37,709,059	13,112,115	50,821,174	51,492,229	36 9	73·5	26·5	8 years 1852–59
52 2	30,824,448	21,535,424	52,359,872	53,132,828	35 11	59·7	40·3	8 years 1860–67
52 0	30,019,038	27,862,328	57,881,366	57,852,953	36 5	51·9	48·1	8 years 1868–75
49 0	24,670,579	33,356,761	58,027,340	58,272,292	34 7	42·6	57·4	3 years 1876–78
53 5	31,941,929	22,227,749	54,169,678	54,616,332	36 2	59·6	40·4	27 years 1852–78

rs, 5·5 the second eight, 5·6 the third eight, and 5·65 the next three years.
umns for the respective periods.

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